

## CLAIMS

What is claimed is:

1. For use with an automatic bowling pinsetter of the type including a vertically movable deck for setting pins on a lane surface, a turret for loading pins into the deck, a rake for clearing fallen pins from the lane surface, a detector for detecting pins standing on the lane surface, a drive motor, a gear box, a clutch coupling the gearbox with the motor, and a mechanical start-stop mechanism for engaging and disengaging the clutch to start and stop the deck and the rake, apparatus replacing the start and stop mechanism, comprising :

a first switch actuated by the rake to produce an electrical cycle start signal;

a second switch actuated by the detector to produce an electrical mid-cycle stop signal;

a third switch actuated by the turret to produce an electrical mid-cycle release signal; and,

an electrical controller coupled with the clutch, and with each of the first, second and third, the controller being operable to -

- (1) engage the clutch in response to the cycle start signal,
- (2) disengage the clutch in response to the mid-cycle stop signal, and
- (3) re-engage the clutch in response to the mid-cycle release signal.

2. The apparatus of Claim 1, wherein the controller includes a first electrical actuator having a shiftable drive member, and linkage connecting the drive member with the clutch.

3. The apparatus of Claim 2, wherein the first motor member includes an electrical solenoid.

4. The apparatus of Claim 2, wherein the controller includes a programmed microcontroller for controlling the operation of the first electrical actuator.

5. The apparatus of Claim 1, including a fourth switch actuated by the detector to produce an electrical out-of-range signal when the detector detects out-of-range pins standing on the lane surface.

6. The apparatus of Claim 5, wherein the controller includes:

a first electrical actuator having a first shiftable drive member, and linkage connecting the drive member with the clutch, and,

a second electrical actuator having a second shiftable drive member, and linkage connecting the second drive member with the deck and the rake, the actuation of the second actuator causing the pinsetter to be reset following the detection of out-of-range standing pins.

7. The apparatus of Claim 6, wherein the controller

includes a programmed microcontroller for controlling the operation of the first and second actuators.

8. The apparatus of Claim 1, including a time delay circuit coupled in series with the first switch for delaying the generation of the cycle start signal for a selected length of time.

9. The apparatus of Claim 2, including a source of electrical power, and wherein the controller includes an electrical relay responsive to the cycle start signal to couple the power source with the electrical actuator.

10. For use with an automatic bowling pinsetter of the type including a vertically movable deck for setting pins on a lane surface, a turret for loading pins into the deck, a rake assembly for clearing fallen pins from the lane surface, a detector for detecting pins standing on the lane surface, a drive motor, a gear box, a clutch coupling the gearbox with the motor, and a mechanical start-stop mechanism for engaging and disengaging the clutch to start and stop the deck and the rake, apparatus replacing the start and stop mechanism, comprising :

a first switch actuated by passage of a first ball through the pinsetter and operative produce an electrical cycle start signal;

a second switch for producing an electrical mid-cycle stop signal when an insufficient number of pins are present in the turret;

a third switch for producing an electrical mid-cycle release signal when a sufficient number of pins have been added to the turret following the production of a mid-cycle stop signal; and,

an electrical controller coupled with the clutch, and with each of the first, second and third, the controller being operable to -

- (1) engage the clutch in response to the cycle start signal,
- (2) disengage the clutch in response to the mid-cycle stop signal, and
- (3) re-engage the clutch in response to the mid-cycle release signal.

11. The apparatus of Claim 10, wherein the first switch is mounted on the pinsetter at a location so as to be displaced by the impact of the ball on the pinsetter.

12. The apparatus of Claim 11, wherein the first switch is mounted on the rake assembly so as to be actuated when the rake moves down toward the lane surface.

14. The apparatus of Claim 10, wherein the second switch is actuated by the detector.

15. The apparatus of Claim 10, wherein the third switch is mounted on and actuated by the turret.

16. The apparatus of Claim 10, including a fourth switch actuated by the detector to produce an electrical out-of-

range signal when the detector detects out-of-range pins standing on the lane surface.

17. The apparatus of Claim 10, wherein the controller includes:

a first electrical actuator having a first shiftable drive member, and linkage connecting the drive member with the clutch, and,

a second electrical actuator having a second shiftable drive member, and linkage connecting the second drive member with the deck and the rake, the actuation of the second actuator causing the pinsetter to be reset following the detection of out-of-range standing pins.

18. The apparatus of Claim 17, wherein the controller includes a programmed microcontroller for controlling the operation of the first and second actuators.

19. The apparatus of Claim 10, including a time delay circuit coupled in series with the first switch for delaying the generation of the cycle start signal for a selected length of time.

20. The apparatus of Claim 17, including a source of electrical power, and wherein the controller includes an electrical relay responsive to the cycle start signal to couple the power source with the first electrical actuator.

21. A method of controlling an automatic bowling pinsetter of the type employing a vertically movable deck for setting

pins on a lane surface, a turret for loading pins into the deck, a rake for clearing fallen pins from the lane surface, a detector for detecting pins standing on the lane surface, a drive motor, a gear box, a clutch coupling the gearbox with the motor, comprising the steps of:

(A) generating an electrical cycle start signal when a first ball passes into the pinsetter;

(B) generating a electrical mid-cycle cycle stop signal when an insufficient number of pins are present in the turret;

(C) following step (B), generating an electrical release signal when a sufficient number of pins are present in the turret; and,

(D) controlling the operation of the clutch to start and stop the clutch using the cycle start, mid-cycle cycle stop and release signals.

22. The method of Claim 21, wherein steps (A), (B) and (C) are each performed by closing an electrical switch.

23. The method of Claim 21, wherein step (D) is performed by:

energizing and de-energizing an electrical actuator using the electrical signals generated in steps (A) - (B), and

operating a clutch lever using the electrical actuator.

24. The method of Claim 21, including the steps of:

(E) generating an electrical out-of-range signal when a pin is moved out of the range of pick up by the deck, and

(F) controlling the operation of the deck and the rake using on the out-of-range signal.

25. The method of Claim 24, wherein step (F) is performed by energizing an electrical actuator, and moving a reset link using the actuator.